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TEST REPORT

Product Name : MPPT BASED SOLAR INVERTER
Model Number : PV18-5248 PRO, PV18-3024 PRO

Prepared for : SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD
Address : A801-803 Common Building, Sogood Science Park, Sanwei
Community Hangcheng Road, Xixiang Bao'an District,
Shenzhen, Guangdong, China

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Date of issue : April 15, 2021



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TEST REPORT DESCRIPTION

Applicant : SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD
 Manufacturer : SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD
 Trade Mark : MUST
 EUT : MPPT BASED SOLAR INVERTER
 Model No. : PV18-5248 PRO, PV18-3024 PRO
 Rating : Input: 230Vac, 35A, 50/60Hz
 Output: 230Vac, 22.6A, 5200W


Measurement Procedure Used:

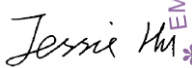
EN 61000-6-3:2007+A1:2011+ AC:2012,
 EN 61000-3-11: 2000,
 EN 61000-3-12: 2011,
 EN IEC 61000-6-1: 2019
 (IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC61000-4-4:2012,
 IEC 61000-4-5:2014, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004)


The device described above is tested by EMTEK (SHENZHEN) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (SHENZHEN) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN61000-6-3, EN61000-3-2, EN61000-3-3 and EN61000-6-1 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (SHENZHEN) CO., LTD.

Date of Test : April 01, 2021 to April 15, 2021

Prepared by : 
Yu Jie/Editor

Reviewer : 
Jessie Hu/Supervisor

Approved & Authorized Signer : 
Lisa Wang/Manager

Modified Information

Version	Report No.	Revision Date	Summary
Ver.1.0	ES210105005E	/	Original Report



1. SUMMARY OF TEST RESULTS

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted Disturbance at Mains Terminals	EN 61000-6-3:2007+A1:2011 + AC:2012	--	Pass
Radiated Disturbance	EN 61000-6-3:2007+A1:2011 + AC:2012	--	Pass
Harmonic Current Emissions	EN 61000-3-11: 2000	Section 5	Pass
Voltage Fluctuation and Flicker	EN 61000-3-12: 2011	Table 2	Pass
IMMUNITY (EN IEC 61000-6-1: 2019)			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008	B	Pass
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2006+A1:2007 +A2:2010	A	Pass
EFT/B Immunity	IEC61000-4-4:2012	B	Pass
Surge Immunity	IEC 61000-4-5:2014	B	Pass
Conducted RF Immunity	IEC 61000-4-6:2013	A	Pass
Power Frequency Magnetic Field	IEC 61000-4-8:2009	A	Pass
Voltage Dips, >95% Reduction	IEC 61000-4-11:2004	B	Pass
Voltage Dips, 30% Reduction		C	Pass
Voltage Interruptions		C	Pass
Note: /			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	:	MPPT BASED SOLAR INVERTER
Model Number	:	PV18-5248 PRO, PV18-3024 PRO (Note: These models are only the product models, input parameters and output parameters are different, and the software carries out the quota. The other models are the same. Our main test model is PV18-5248 PRO)
Applicant	:	SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD
Address	:	A801-803 Common Building, Sogood Science Park, Sanwei Community Hangcheng Road, Xixiang Bao'an District, Shenzhen, Guangdong, China
Manufacturer	:	SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD
Address	:	A801-803 Common Building, Sogood Science Park, Sanwei Community Hangcheng Road, Xixiang Bao'an District, Shenzhen, Guangdong, China
Factory	:	MUST ENERGY (GUANGDONG) TECHNOLOGY CO.,LTD
Address	:	2-5 floor of No.8 building, No.115, Zhangcha Road 1, Chancheng district, Foshan city, Guangdong Province, P.R.China
Date of Received	:	April 01, 2021
Date of Test	:	April 01, 2021 to April 15, 2021

2.2. Independent Operation Modes

- A. On
1. off-grid mode
 2. AC charger mode
 3. Pv input mode

2.3. Test Manner

Test Items	Test Voltage	Operation Modes	Worst case
Conducted Disturbance at Mains Terminals	DC 48V AC 230V/50Hz	Mode A.2	Mode A.1
Radiated emissions at frequencies up to 1 GHz	DC 48V AC 230V/50Hz DC 360V	Mode A.1 Mode A.2 Mode A.3	Mode A.1 Mode A.2 Mode A.3
Harmonic Current Emissions	AC 230V/50Hz, DC 48V	Mode A.2	\
Voltage Fluctuation and Flicker	AC 230V/50Hz, DC 48V	Mode A.2	\
Electrostatic Discharge	DC 48V AC 230V/50Hz DC 360V	Mode A.1 Mode A.2 Mode A.3	\
Continuous RF electromagnetic field disturbances	DC 48V AC 230V/50Hz DC 360V	Mode A.1 Mode A.2 Mode A.3	\
Electrical fast transients/burst	AC 230V/50Hz, DC 48V	Mode A.2	\
Surges	AC 230V/50Hz, DC 48V	Mode A.2	\
Continuous induced RF disturbances	AC 230V/50Hz, DC 48V	Mode A.2	\
Power frequency magnetic field	DC 48V AC 230V/50Hz DC 360V	Mode A.1 Mode A.2 Mode A.3	\
Voltage dips and interruptions	AC 230V/50Hz, DC 48V	Mode A.2	\

2.4. Description of Test Facility

Site Description
EMC Lab.

: **Accredited by CNAS**

The Certificate Registration Number is L2291.

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01 (identical to ISO/IEC 17025:2017)

Accredited by FCC

Designation Number: CN1204

Test Firm Registration Number: 882943

Accredited by A2LA

The Certificate Number is 4321.01.

Accredited by Industry Canada

The Conformity Assessment Body Identifier is CN0008

Name of Firm : EMTEK (SHENZHEN) CO., LTD.

Site Location : Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

2.5. Description of Support Device

N/A

2.6. Measurement Uncertainty

Test Item	Uncertainty
Conducted Emission Uncertainty	: 3.16dB(9k~150kHz Conduction 2#) 2.90dB(150k-30MHz Conduction 2#)
Radiated Emission Uncertainty (3m 3# Chamber)	: 4.40dB (30M~1GHz Polarize: H) 5.04dB (30M~1GHz Polarize: V)
Uncertainty for Flicker test	: 0.07%
Uncertainty for Harmonic test	: 1.8%
Uncertainty for C/S Test	: 1.45(Using CDN Test)
Uncertainty for R/S Test	: 2.10dB(80MHz-200MHz) 1.76dB(200MHz-1000MHz)
Uncertainty for test site temperature and humidity	: 0.6°C 4%

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1. For Power Line Conducted Emission Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESCI	101045	May 17, 2020	1Year
<input checked="" type="checkbox"/>	PULSE LIMTER	Rohde & Schwarz	ESH3-Z2	100107	May 16, 2020	1Year
<input checked="" type="checkbox"/>	AMN	Schwarzbeck	NNLK 8129	8129203	May 16, 2020	1Year

3.2. For Radiated Emission Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESU 26	100154	May 17, 2020	1Year
<input checked="" type="checkbox"/>	Pre-Amplifie	Lunar EM	LNA10M1G-40	J1011130912001	May 17, 2020	1Year
<input checked="" type="checkbox"/>	Bilog Antenna	Schwarzbeck	VULB9163	659	Sep 22, 2019	2 Year

3.3. For Harmonic Current / Flicker Measurement

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	45KVA AC Power source	Teseq	NSG 1007-45/45KVA	1305A02873	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Impedance network	Teseq	INA2197/37A	1305A02873	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Impedance network	Teseq	INA 2196/75A	1305A02874	May 17, 2020	1 Year
<input type="checkbox"/>	Proflin 2100 AC Switching Unit	Teseq	NSG 2200-3	A22714	May 17, 2020	1 Year

3.4. For Electrostatic Discharge Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	ESD Tester	TESEQ AG	NSG 438A	130	May 17, 2020	1 Year

3.5. For RF Strength Susceptibility Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	AS0102-55	1018770	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	50ohm Diode Power Sensor	BOONTON	51011EMC	34236	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	811	N/A	N/A
<input checked="" type="checkbox"/>	Signal Generator	Agilent	N5181A	MY50145187	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	50ohm Diode Power Sensor	BOONTON	51011EMC	36164	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Broad-Band Horn Antenna	SCHWARZBECK	STLP 9149	9149-227	N/A	N/A
<input checked="" type="checkbox"/>	Field Strength Meter	DARE	RSS1006A	10I00037SNO22	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Multi-function interface system	DARE	CTR1009B	12I00250SNO72	N/A	N/A
<input checked="" type="checkbox"/>	Automatic switch group	DARE	RSW1004A	N/A	N/A	N/A
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	AS1860-50	1059346	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Power Amplifier	MILMEGA	80RF1000-175	1059345	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Directional Coupler	MILMEGA	DC6180AM1	0340463	May 16, 2020	1 Year

3.6. For Electrical Fast Transient / Burst Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Burst Tester	HAEFELY	PEFT4010	080981-16	May 16, 2020	1 Year
<input type="checkbox"/>	Coupling Clamp	HAEFELY	IP-4A	147147	May 16, 2020	1 Year
<input type="checkbox"/>	Three phase CDN	Teseq	CDN 163	202	May 16, 2020	1 Year

3.7. For Surge Immunity Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Controller	HAEFELY	Psurge 8000	174031	May 16, 2020	1 Year
<input checked="" type="checkbox"/>	Impulse Module	HAEFELY	PIM 100	174124	May 16, 2020	1 Year
<input checked="" type="checkbox"/>	Coupling Decoupling	HAEFELY	PCD 130	172181	May 16, 2020	1 Year
<input type="checkbox"/>	Coupling Module	HAEFELY	PCD122	174354	May 16, 2020	1 Year
<input type="checkbox"/>	Impulse Module	HAEFELY	PIM 120	174435	May 16, 2020	1 Year
<input type="checkbox"/>	Coupling Module	HAEFELY	PCD 126A	174387	May 16, 2020	1 Year
<input type="checkbox"/>	Impulse Module	HAEFELY	PIM 110	174391	May 16, 2020	1 Year
<input type="checkbox"/>	Impulse Module	HAEFELY	PIM 150	178707	May 16, 2020	1 Year
<input type="checkbox"/>	Impulse Module	PMI	PCDN8	190422	May 16, 2020	1 Year

3.8. For Injected Current Susceptibility Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Continuous Wave Simulator	EMTEST	CWS500C	0900-12	May 17, 2020	1Year
<input checked="" type="checkbox"/>	CDN	EMTEST	CDN-M2	510010010010	May 16, 2020	1Year
<input checked="" type="checkbox"/>	CDN	EMTEST	CDN-M3	0900-11	May 16, 2020	1Year
<input checked="" type="checkbox"/>	EM Injection Clamp	EMTEST	F-2031-23MM	368	May 16, 2020	1Year
<input checked="" type="checkbox"/>	Attenuator	EMTEST	100W 6dB DC-3G	/	May 16, 2020	1Year
<input type="checkbox"/>	Signal Generator	R&S	SMB100A	103041	May 17, 2020	1Year
<input type="checkbox"/>	CDN	LUTHI	CDN L-801 M2/M3	2606	May 16, 2020	1Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M332S	32655	May 16, 2020	1Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M432S	33670	May 16, 2020	1Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M432-3LNS	34048	May 16, 2020	1Year
<input type="checkbox"/>	Three phase CDN	TESEQ	CDN M532S	33799	May 16, 2020	1Year

3.9. For Magnetic Field Immunity Test

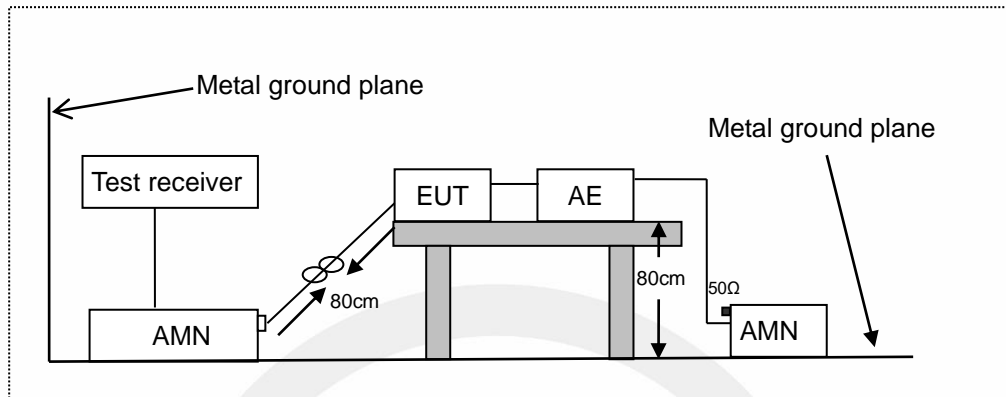
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	Magnetic Field Tester	HAEFELY	MAG100	250040.1	May 17, 2020	1 Year

3.10. For Voltage Dips and Interruptions Test

Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
<input checked="" type="checkbox"/>	45KVA AC Power source	Teseq	NSG 1007-45/45K VA	1305A02873	May 17, 2020	1 Year
<input type="checkbox"/>	Signal conditioning Unit	Teseq	CCN 1000-3	1305A02873	May 17, 2020	1 Year
<input type="checkbox"/>	Impedance network	Teseq	INA2197/37A	1305A02873	May 17, 2020	1 Year
<input type="checkbox"/>	Impedance network	Teseq	INA 2196/75A	1305A02874	May 17, 2020	1 Year
<input checked="" type="checkbox"/>	Proflin 2100 AC Switching Unit	Teseq	NSG 2200-3	A22714	May 17, 2020	1 Year

4. POWER LINE CONDUCTED EMISSION MEASUREMENT

4.1. Block Diagram of Test Setup



LISN: Artificial Mains Network
 AE: Associated equipment
 EUT: Equipment under test

4.2. Measuring Standard

EN 61000-6-3:2007+A1:2011+ AC:2012

4.3. Power Line Conducted Emission Limits

Frequency (MHz)	Limit (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.
 NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

4.4. EUT Configuration of Measurement

The following equipments are installed on Conducted Emission Measurement to meet EN 61000-6-3 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

EUT : MPPT BASED SOLAR INVERTER
 Model Number : PV18-5248 PRO

4.5. Test Procedure

The EUT is put on the plane 0.1m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the EN61000-6-3 regulations during conducted emission measurement.

The bandwidth of the field strength meter (R&S Test Receiver) is set at 9kHz in 150kHz~30MHz and 200Hz in 9kHz~150kHz.

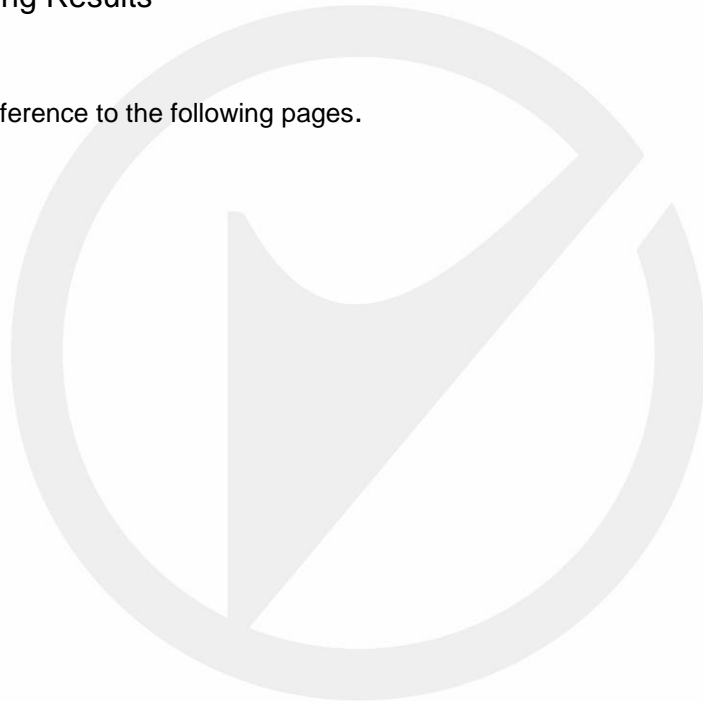
The frequency range from 150kHz to 30MHz is investigated.

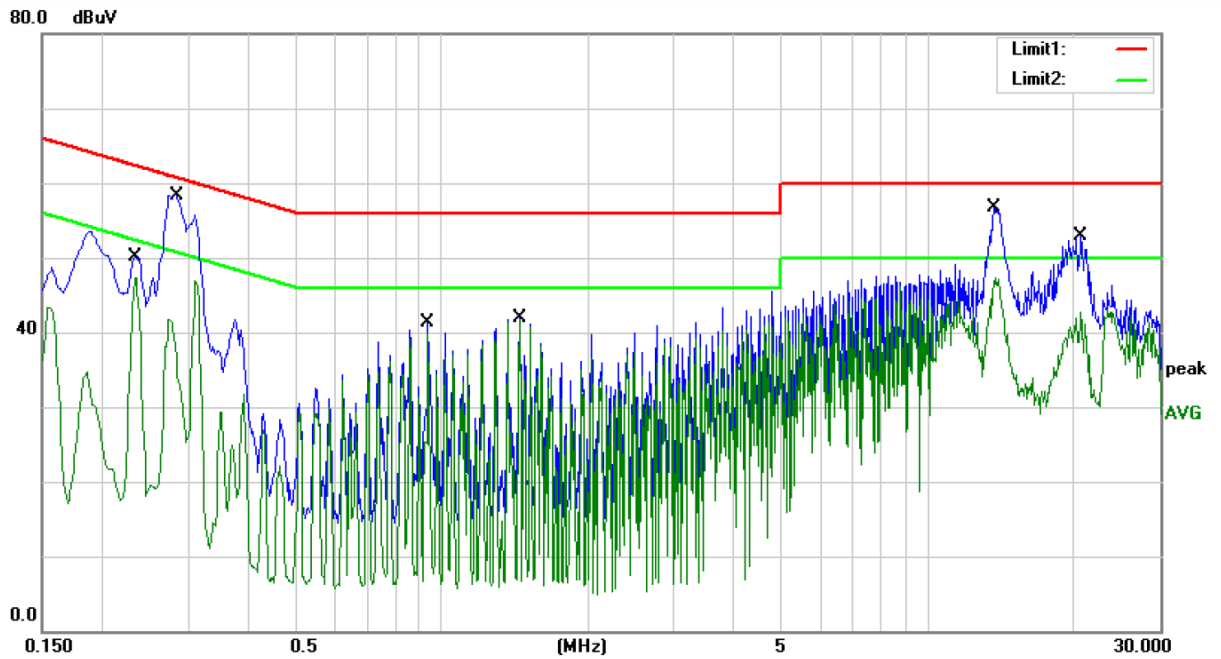
All the scanning waveform is put in the following pages.

4.6. Measuring Results

PASS.

Please reference to the following pages.

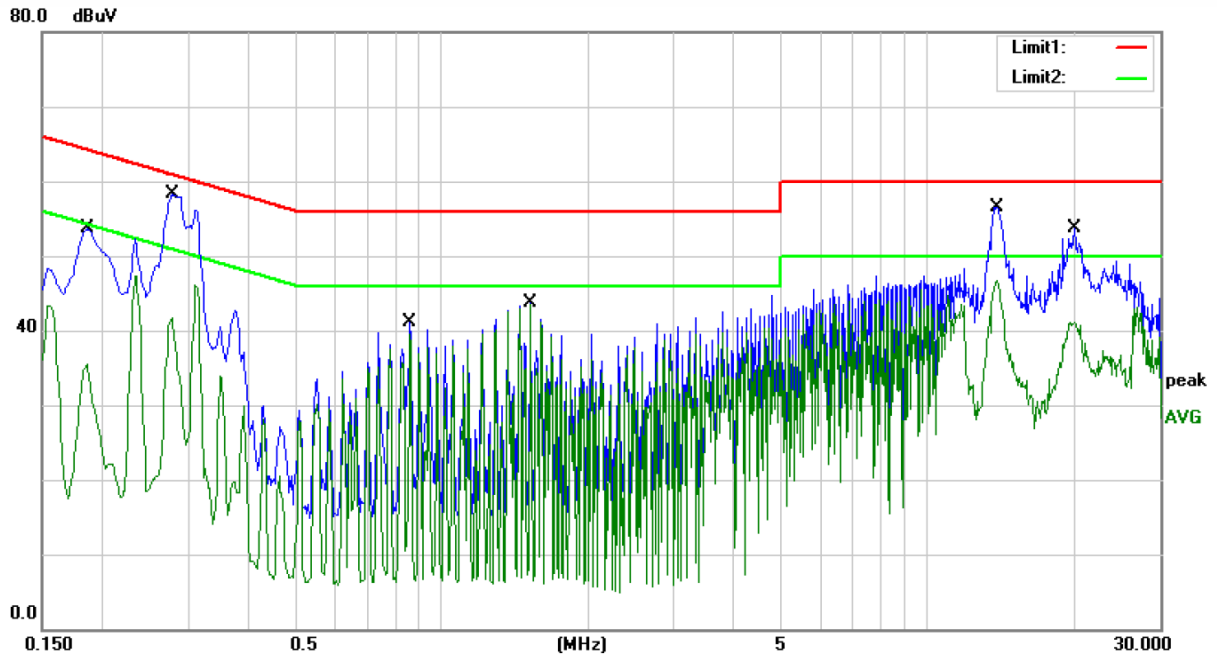




Site Conduction #2 Phase: **L1** Temperature: 25
 Limit: (CE)EN61000-6-3_QP Power: AC 230V/50Hz DC48V Humidity: 55 %
 Mode: AC Charger Mode
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2340	39.65	10.40	50.05	62.31	-12.26	QP	
2		0.2340	36.92	10.40	47.32	52.31	-4.99	AVG	
3		0.2862	47.23	10.39	57.62	60.63	-3.01	QP	
4		0.2862	36.58	10.39	46.97	50.63	-3.66	AVG	
5		0.9380	31.00	10.28	41.28	56.00	-14.72	QP	
6		0.9380	29.60	10.28	39.88	46.00	-6.12	AVG	
7		1.4420	31.74	10.23	41.97	56.00	-14.03	QP	
8		1.4420	31.44	10.23	41.67	46.00	-4.33	AVG	
9		13.6340	46.36	10.29	56.65	60.00	-3.35	QP	
10	*	13.6340	37.07	10.29	47.36	50.00	-2.64	AVG	
11		20.6460	42.64	10.33	52.97	60.00	-7.03	QP	
12		20.6460	32.37	10.33	42.70	50.00	-7.30	AVG	

:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: WOLF



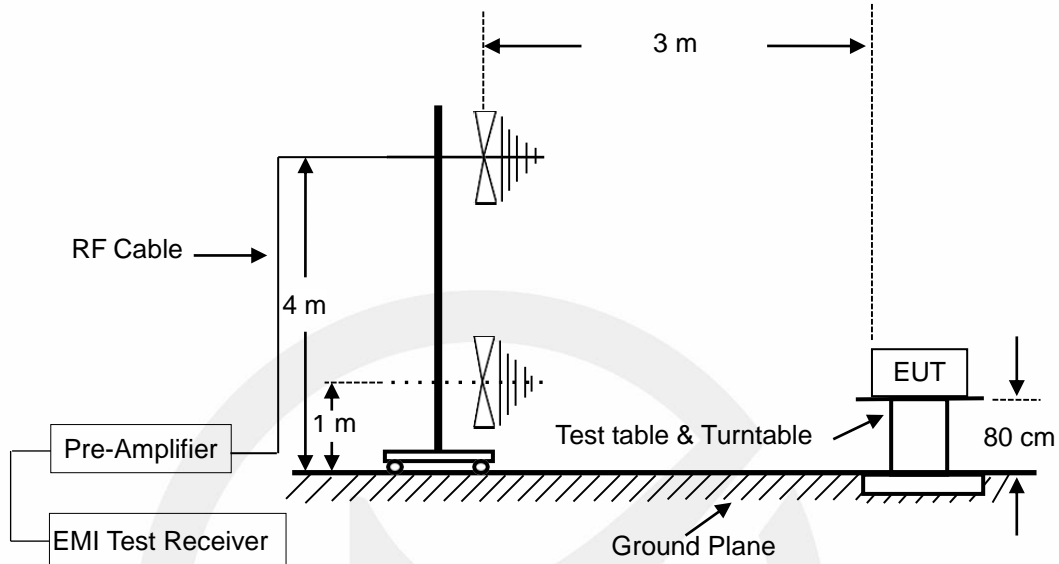
Site Conduction #2 Phase: **N** Temperature: 25
 Limit: (CE)EN61000-6-3_QP Power: AC 230V/50Hz DC48V Humidity: 55 %
 Mode: AC Charger Mode
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1860	43.20	10.47	53.67	64.21	-10.54	QP	
2		0.1860	25.05	10.47	35.52	54.21	-18.69	AVG	
3		0.2780	47.91	10.39	58.30	60.88	-2.58	QP	
4		0.2780	31.31	10.39	41.70	50.88	-9.18	AVG	
5		0.8580	30.79	10.33	41.12	56.00	-14.88	QP	
6		0.8580	29.24	10.33	39.57	46.00	-6.43	AVG	
7		1.5220	33.54	10.23	43.77	56.00	-12.23	QP	
8	*	1.5220	33.28	10.23	43.51	46.00	-2.49	AVG	
9		13.8740	46.15	10.29	56.44	60.00	-3.56	QP	
10		13.8740	36.34	10.29	46.63	50.00	-3.37	AVG	
11		19.9900	43.39	10.31	53.70	60.00	-6.30	QP	
12		19.9900	30.88	10.31	41.19	50.00	-8.81	AVG	

Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: WOLF

5. RADIATED EMISSION MEASUREMENT

5.1. Block Diagram of Test Setup



5.2. Measuring Standard

EN 61000-6-3:2007+A1:2011+ AC:2012

5.3. Radiated Emission Limits

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dB μ V/m)
30 ~ 230	3	40
230 ~ 1000	3	47

Note: (1) The smaller limit shall apply at the combination point between two frequency bands.
 (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

5.4. EUT Configuration of Measurement

The EN 61000-6-3 regulations test method must be used to find the maximum emission during radiated emission measurement.

EUT : MPPT BASED SOLAR INVERTER
 Model Number : PV18-5248 PRO

5.5. Test Procedure

The EUT is placed on a turntable which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna that is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

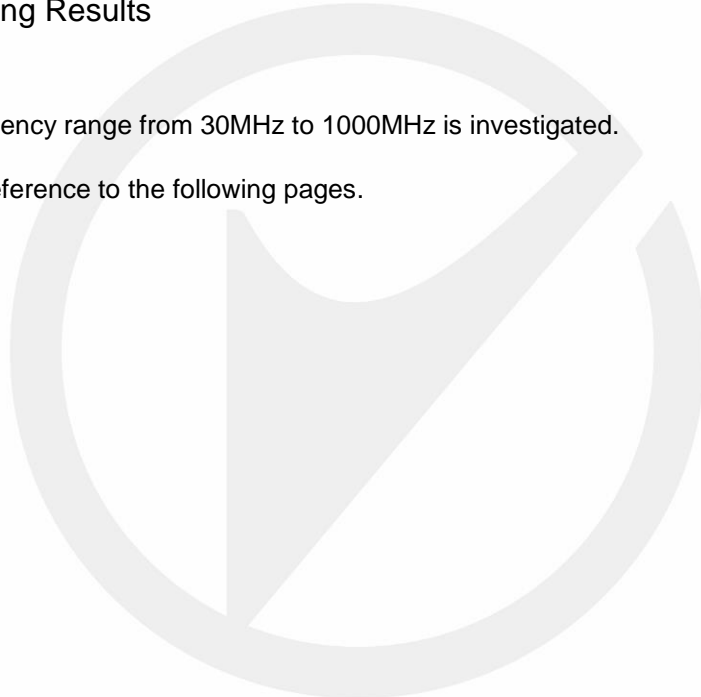
All the modes were tested and the worst mode (AC Charger Mode) refer to the following pages.

5.6. Measuring Results

PASS.

The frequency range from 30MHz to 1000MHz is investigated.

Please reference to the following pages.





Site 3m Chamber #3

Polarization: **Horizontal**

Temperature: 21.6 C

Limit: (RE)EN61000-6-3

Power: AC 230V/50Hz DC48V

Humidity: 45 %

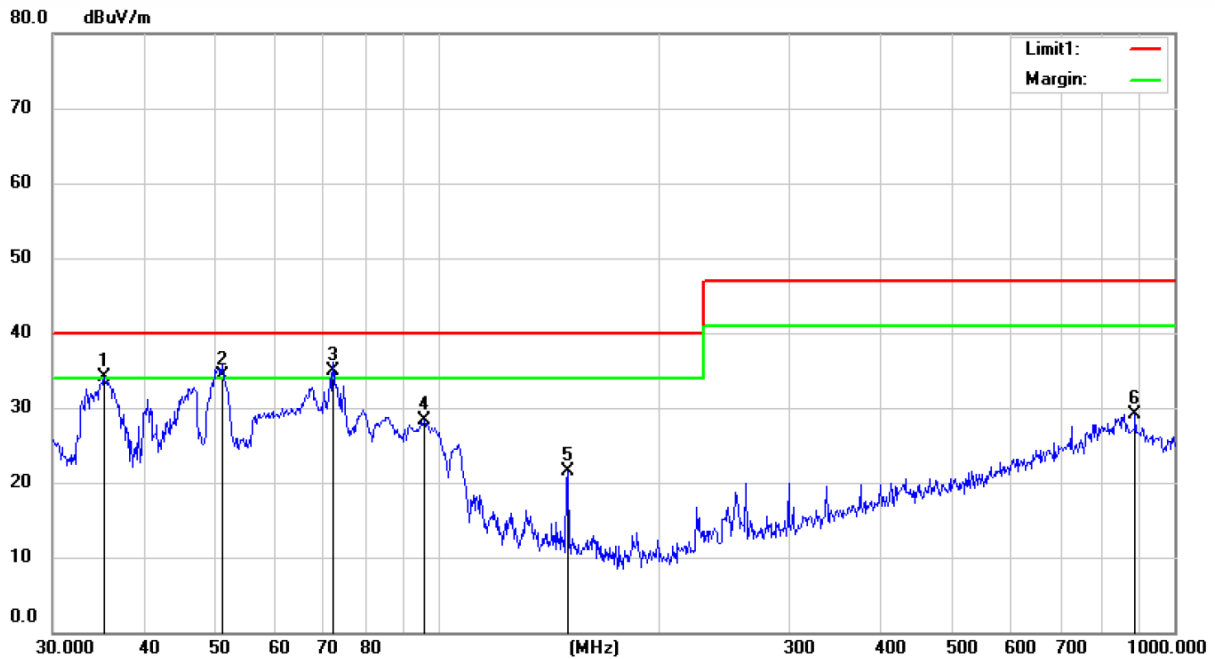
Mode: Off-grid Mode

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		35.7020	44.24	-16.32	27.92	40.00	-12.08	QP		
2		50.4090	45.55	-14.79	30.76	40.00	-9.24	QP		
3		66.7032	47.74	-15.21	32.53	40.00	-7.47	QP		
4	*	150.0108	53.08	-17.14	35.94	40.00	-4.06	QP		
5		299.9725	43.11	-12.81	30.30	47.00	-16.70	QP		
6		375.1155	37.97	-10.31	27.66	47.00	-19.34	QP		

! : Maximum data x : Over limit ! : over margin

Operator:

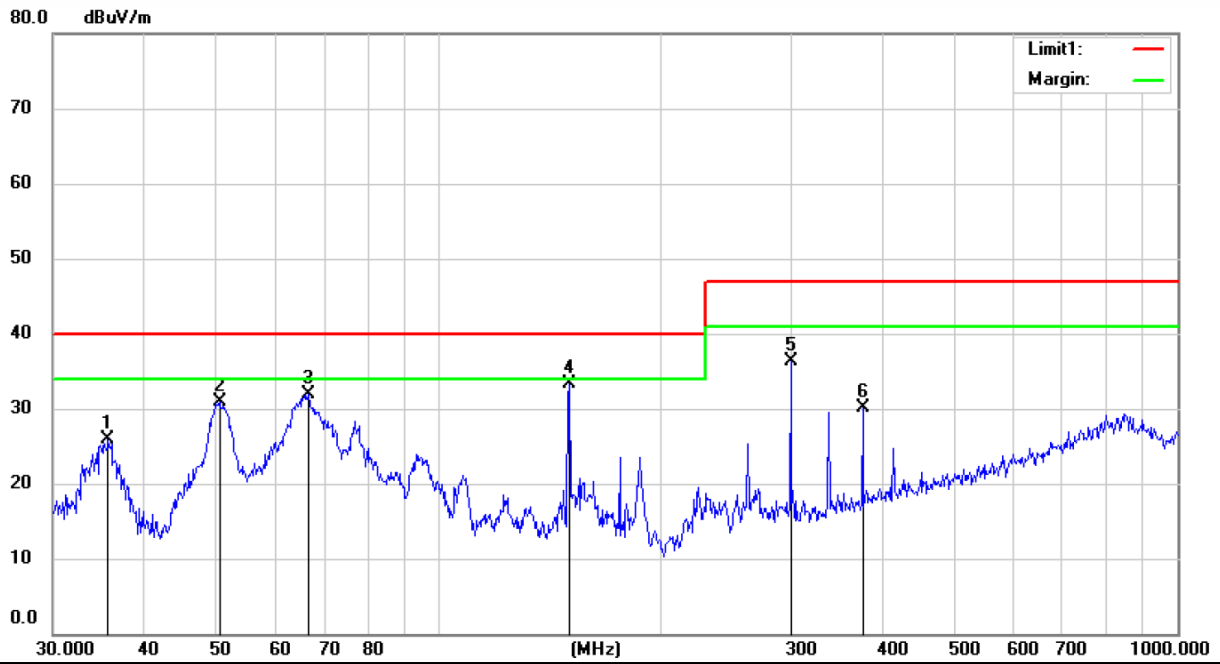


Site 3m Chamber #3 Polarization: **Vertical** Temperature: 21.6 C
 Limit: (RE)EN61000-6-3 Power: AC 230V/50Hz DC48V Humidity: 45 %
 Mode:Off-grid Mode
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1	!	35.3130	50.49	-16.44	34.05	40.00	-5.95	QP		
2	!	50.9420	49.03	-14.73	34.30	40.00	-5.70	QP		
3	*	72.3058	51.32	-16.42	34.90	40.00	-5.10	QP		
4		95.9723	45.82	-17.55	28.27	40.00	-11.73	QP		
5		150.0107	38.71	-17.14	21.57	40.00	-18.43	QP		
6		886.4433	29.40	-0.36	29.04	47.00	-17.96	QP		

! :Maximum data x:Over limit !:over margin

Operator:



Site 3m Chamber #3 Polarization: **Horizontal** Temperature: 21.6 C

Limit: (RE)EN61000-6-3
Mode: AC Charge Mode

Power: AC 230V/50Hz DC48V

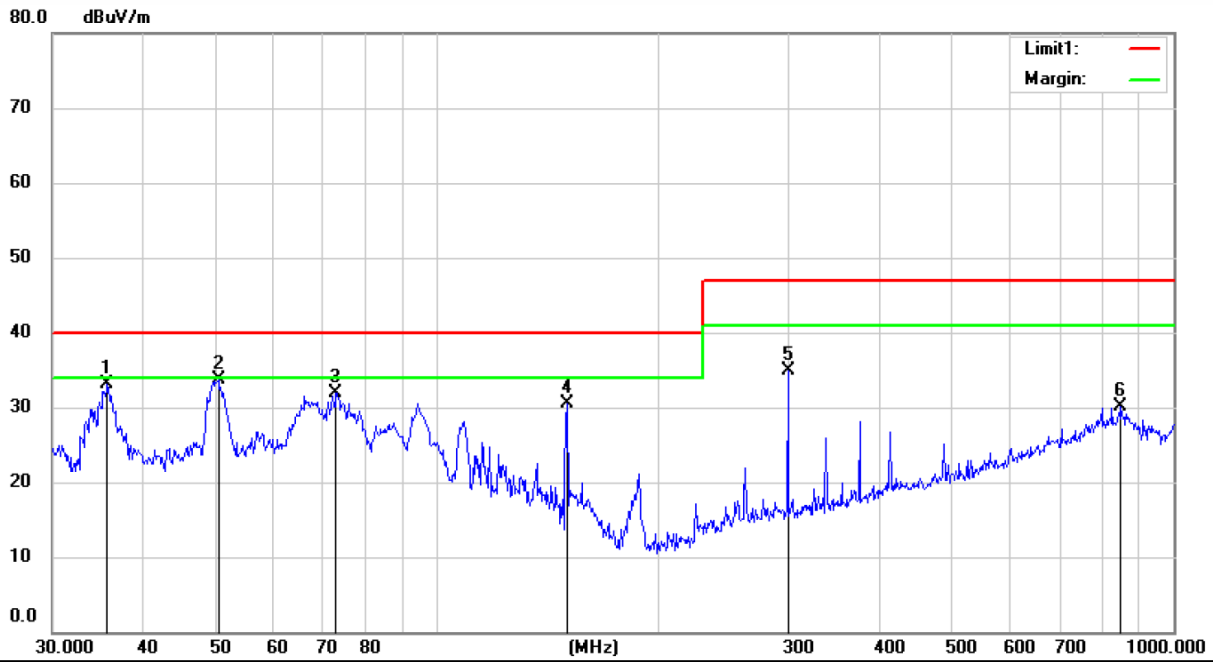
Humidity: 45 %

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		35.7020	42.16	-16.32	25.84	40.00	-14.16	QP		
2		50.4752	45.72	-14.78	30.94	40.00	-9.06	QP		
3		66.5572	46.99	-15.18	31.81	40.00	-8.19	QP		
4	*	150.0108	50.39	-17.14	33.25	40.00	-6.75	QP		
5		299.9725	49.13	-12.81	36.32	47.00	-10.68	QP		
6		374.9511	40.48	-10.31	30.17	47.00	-16.83	QP		

! :Maximum data x:Over limit !:over margin

Operator:



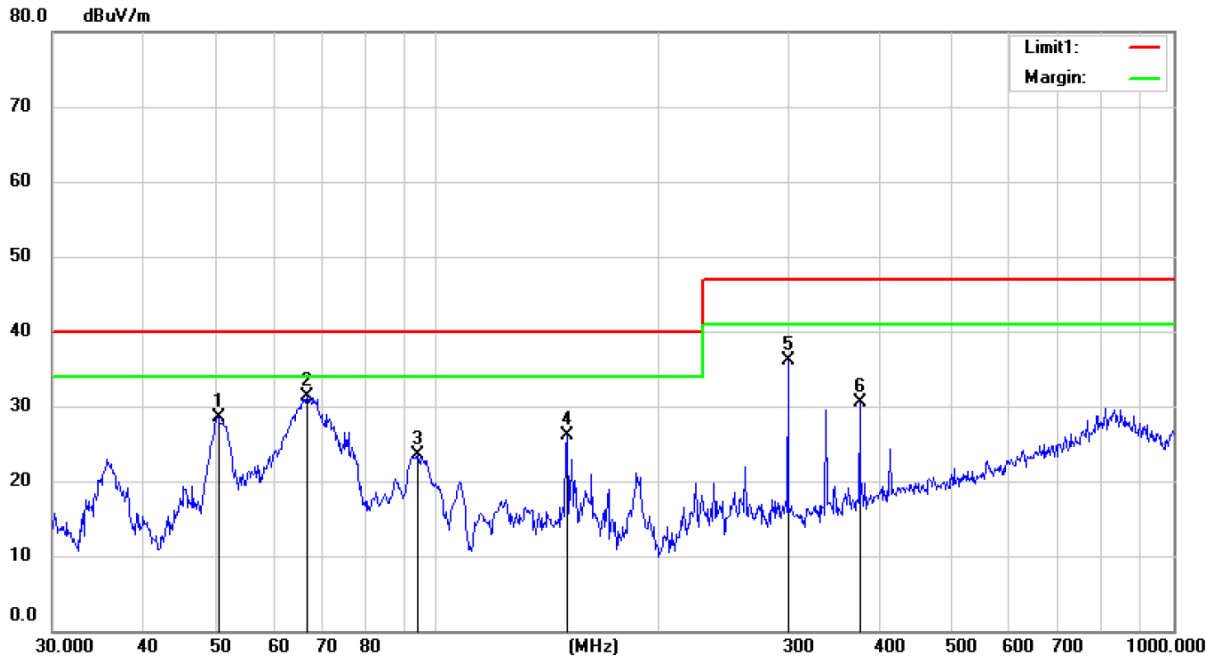
Site 3m Chamber #3 Polarization: **Vertical** Temperature: 21.6 C
 Limit: (RE)EN61000-6-3 Power: AC 230V/50Hz DC48V Humidity: 45 %
 Mode: AC Charge Mode

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		35.7177	49.46	-16.31	33.15	40.00	-6.85			QP
2	*	50.4310	48.45	-14.79	33.66	40.00	-6.34			QP
3		72.9744	48.52	-16.56	31.96	40.00	-8.04			QP
4		150.0107	47.68	-17.14	30.54	40.00	-9.46			QP
5		299.9725	47.62	-12.81	34.81	47.00	-12.19			QP
6		850.6622	29.01	1.02	30.03	47.00	-16.97			QP

⌘:Maximum data x:Over limit !:over margin

Operator:



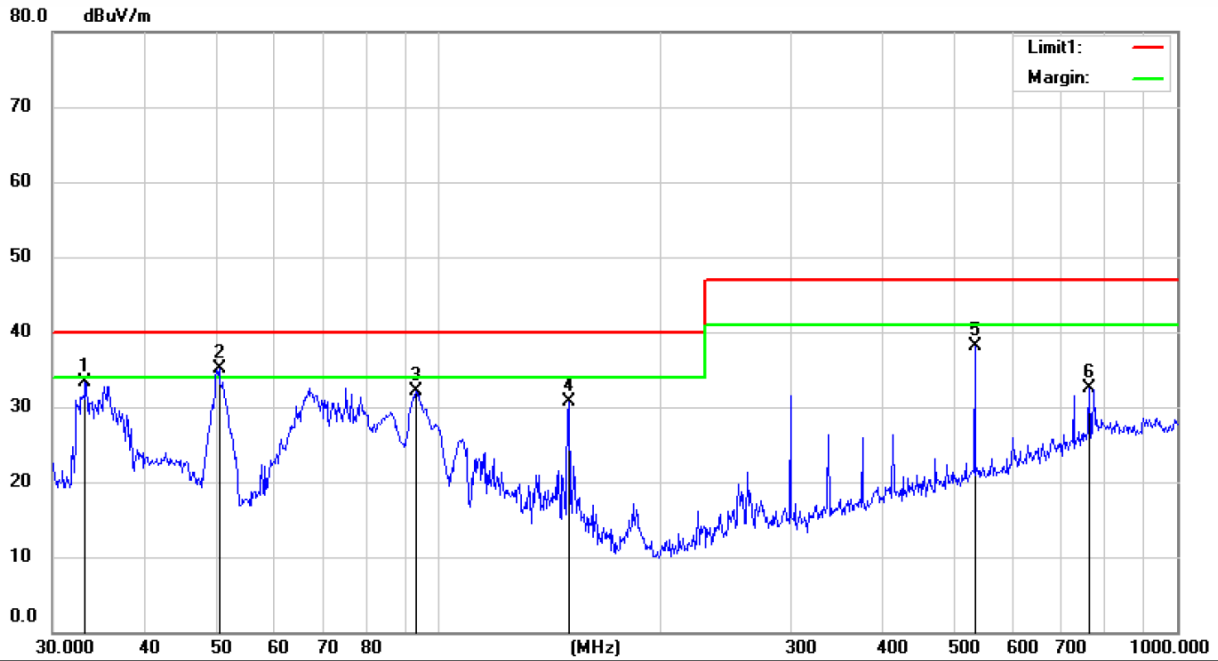
Site: 3m Chamber #3 Polarization: **Horizontal** Temperature: 21.6 C
 Limit: (RE)EN61000-6-3 Power: AC 230V/50Hz DC48V Humidity: 45 %
 Mode: PV Input Mode

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		50.4531	43.23	-14.78	28.45	40.00	-11.55	QP		
2	*	66.6156	46.60	-15.20	31.40	40.00	-8.60	QP		
3		94.1391	41.23	-17.68	23.55	40.00	-16.45	QP		
4		150.0108	43.18	-17.14	26.04	40.00	-13.96	QP		
5		300.1041	49.01	-12.81	36.20	47.00	-10.80	QP		
6		375.1155	40.88	-10.31	30.57	47.00	-16.43	QP		

!:Maximum data x:Over limit !:over margin

Operator:



Site: 3m Chamber #3 Polarization: **Vertical** Temperature: 21.6 C
 Limit: (RE)EN61000-6-3 Power: AC 230V/50Hz DC48V Humidity: 45 %
 Mode: PV Input Mode
 Note:

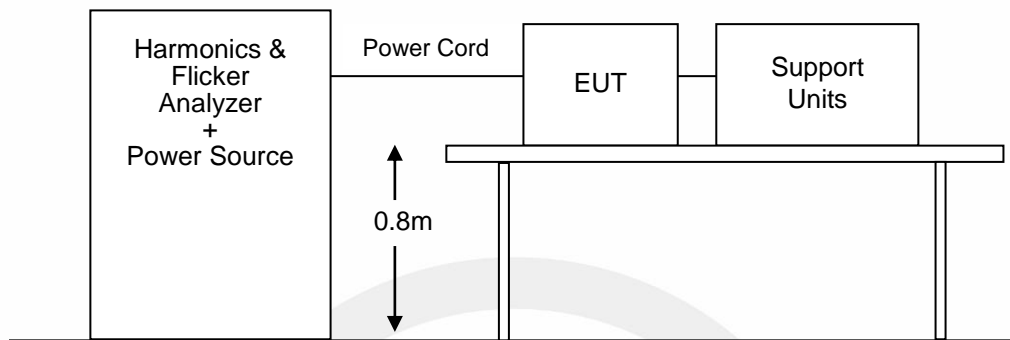
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		33.3278	50.33	-16.93	33.40	40.00	-6.60			QP
2	*	50.4752	49.81	-14.78	35.03	40.00	-4.97			QP
3		93.3174	49.97	-17.84	32.13	40.00	-7.87			QP
4		150.0107	47.84	-17.14	30.70	40.00	-9.30			QP
5		532.4300	45.22	-7.12	38.10	47.00	-8.90			QP
6		762.3724	33.47	-0.91	32.56	47.00	-14.44			QP

⌘:Maximum data x:Over limit !:over margin

Operator:

6. HARMONIC CURRENT EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup



6.2. Measuring Standard

EN 61000-3-12: 2011

6.3. Operation Condition of EUT

6.3.1. Setup the EUT as shown on Section 6.1.

6.3.2. Turn on the power of all equipment.

6.3.3. Let the EUT work in measuring mode (AC Charger Mode) and measure it.

6.4. Measuring Results

PASS.

Please reference to the following pages.

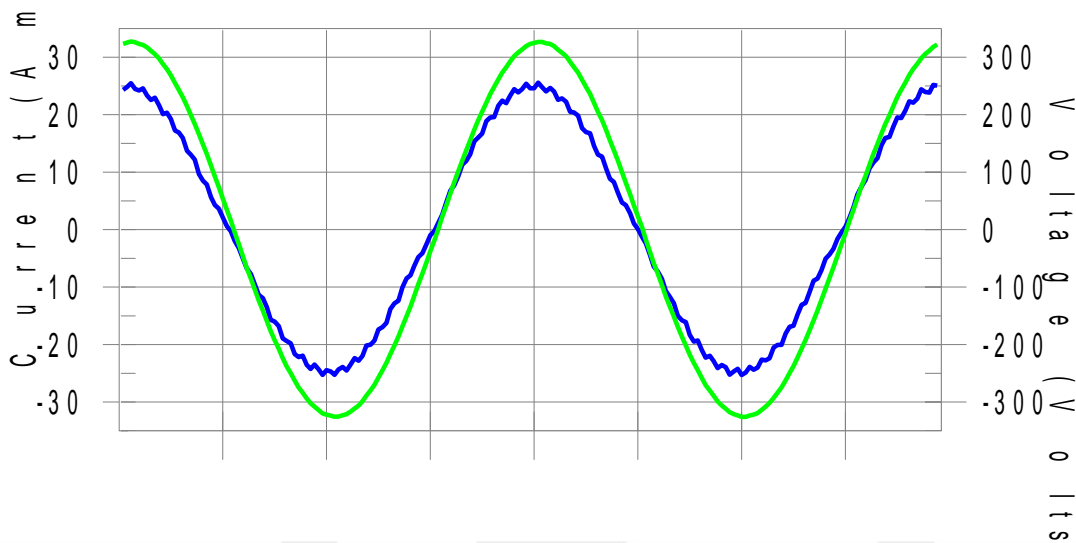
Harmonics – Per EN/IEC61000-3-12, Ed. 2.0(Run time)

EUT: PV18-5248 PRO	Tested by: MUNDO
Test category: Table:2, Rsce=33, Inter-Harm,	Test Margin: 100
Test date: 2021/4/6	Start time: 17:15:54
Test duration (min): 2.5	End time: 17:18:37
Comment: AC Charging Mode	Data file name: WIN2106_H-000449.cts_data
Customer: SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD	

Test Result: Pass

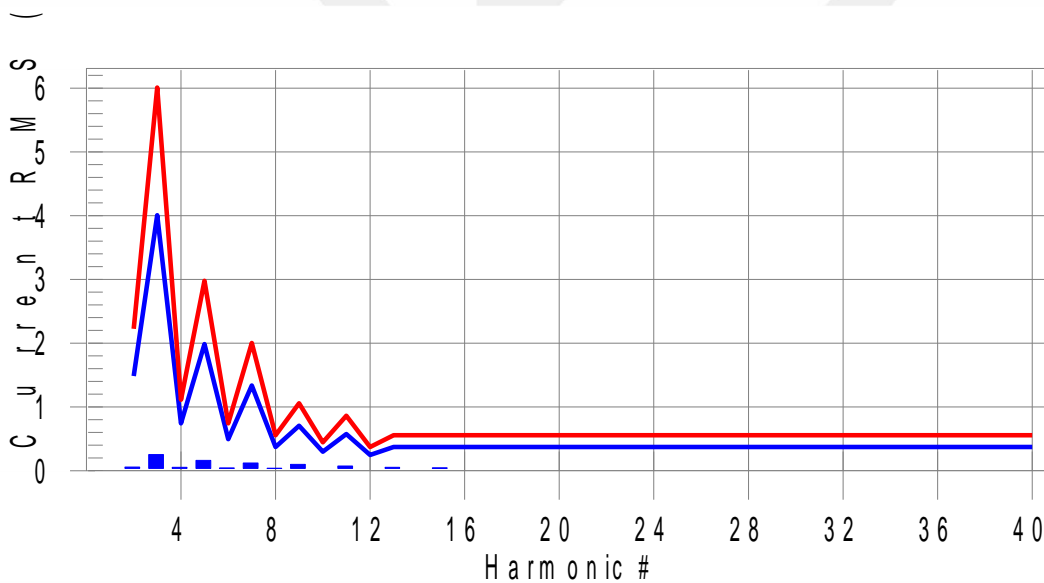
Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 2 limit line

European Limits



Test result: Pass Worst harmonics H13-15.8% of 150% limit, H13-14.3% of 100% limit.

Current Test Result Summary (Run time)

EUT: PV18-5248 PRO Tested by: MUNDO
 Test category: Table:2, Rsc=33, Inter-Harm, Test Margin: 100
 Test date: 2021/4/6 Start time: 17:15:54 End time: 17:18:37
 Test duration (min): 2.5 Data file name: WIN2106_H-000449.cts_data
 Comment: AC Charging Mode
 Customer: SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD

Test Result: Pass Measured Iref: 18.546(Amps) Source: Normal
 THC/Iref (%): 1.3 Limit (%): 23.0 PWHC/Iref (%): 0.0 PWHC Limit (%): 23.0

Highest parameter values during test:

V_RMS (Volts): 230.58	Frequency (Hz): 50.00
I_Peak (Amps): 29.407	I_RMS (Amps): 19.996
I_Fund (Amps): 18.537(avg)	Crest Factor: 1.475
Power (Watts): 4596	Power Factor: 0.997

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.057	1.484	3.8	0.089	2.226	4.0	Pass
3	0.254	4.006	6.3	0.278	6.009	4.6	Pass
4	0.053	0.742	7.1	0.083	1.113	7.4	Pass
5	0.162	1.984	8.2	0.171	2.977	5.7	Pass
6	0.043	0.495	8.8	0.069	0.742	9.3	Pass
7	0.120	1.335	9.0	0.139	2.003	7.0	Pass
8	0.037	0.371	10.1	0.063	0.556	11.4	Pass
9	0.098	0.705	13.9	0.125	1.057	11.9	Pass
10	0.029	0.297	9.6	0.052	0.445	11.7	Pass
11	0.071	0.575	12.4	0.106	0.862	12.3	Pass
12	0.020	0.247	8.0	0.041	0.371	11.2	Pass
13	0.053	0.371	14.3	0.088	0.556	15.8	Pass
14	0.014	N/A	N/A	0.030	N/A	N/A	N/A
15	0.045	N/A	N/A	0.078	N/A	N/A	N/A
16	0.013	N/A	N/A	0.020	N/A	N/A	N/A
17	0.033	N/A	N/A	0.058	N/A	N/A	N/A
18	0.014	N/A	N/A	0.020	N/A	N/A	N/A
19	0.028	N/A	N/A	0.043	N/A	N/A	N/A
20	0.016	N/A	N/A	0.023	N/A	N/A	N/A
21	0.026	N/A	N/A	0.035	N/A	N/A	N/A
22	0.014	N/A	N/A	0.021	N/A	N/A	N/A
23	0.025	N/A	N/A	0.029	N/A	N/A	N/A
24	0.011	N/A	N/A	0.019	N/A	N/A	N/A
25	0.023	N/A	N/A	0.028	N/A	N/A	N/A
26	0.008	N/A	N/A	0.015	N/A	N/A	N/A
27	0.015	N/A	N/A	0.022	N/A	N/A	N/A
28	0.006	N/A	N/A	0.011	N/A	N/A	N/A
29	0.009	N/A	N/A	0.015	N/A	N/A	N/A
30	0.004	N/A	N/A	0.006	N/A	N/A	N/A
31	0.006	N/A	N/A	0.013	N/A	N/A	N/A
32	0.004	N/A	N/A	0.007	N/A	N/A	N/A
33	0.006	N/A	N/A	0.009	N/A	N/A	N/A
34	0.005	N/A	N/A	0.009	N/A	N/A	N/A
35	0.007	N/A	N/A	0.008	N/A	N/A	N/A
36	0.005	N/A	N/A	0.009	N/A	N/A	N/A
37	0.006	N/A	N/A	0.008	N/A	N/A	N/A
38	0.005	N/A	N/A	0.010	N/A	N/A	N/A
39	0.006	N/A	N/A	0.009	N/A	N/A	N/A
40	0.005	N/A	N/A	0.009	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Voltage Source Verification Data (Run time)

EUT: PV18-5248 PRO Tested by: MUNDO
 Test category: Table:2, Rsce=33, Inter-Harm, Test Margin: 100
 Test date: 2021/4/6 Start time: 17:15:54 End time: 17:18:37
 Test duration (min): 2.5 Data file name: WIN2106_H-000449.cts_data
 Comment: AC Charging Mode
 Customer: SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD

Test Result: Pass Source qualification: Normal
 Measured source distortion is within the requirements of the standards
 Measurements are compliant with IEC/EN61000-3-12 Ed. 2.0 & IEC/EN61000-4-7 Ed. 2.1

Highest parameter values during test:

Voltage (Vrms):	230.58	Frequency (Hz):	50.00
I_Peak (Amps):	29.407	I_RMS (Amps):	19.996
I_Fund (Amps):	18.537(avg)	Crest Factor:	1.475
Power (Watts):	4596	Power Factor:	0.997

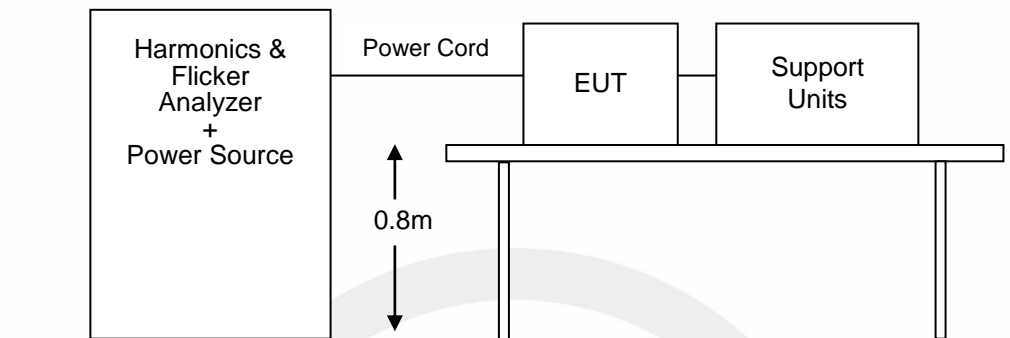
Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.090	0.922	9.75	OK
3	0.148	2.881	5.13	OK
4	0.040	0.922	4.38	OK
5	0.074	3.458	2.13	OK
6	0.041	0.922	4.42	OK
7	0.117	2.882	4.07	OK
8	0.053	0.922	5.74	OK
9	0.133	1.383	9.58	OK
10	0.053	0.922	5.74	OK
11	0.127	1.614	7.88	OK
12	0.052	0.692	7.56	OK
13	0.119	1.383	8.62	OK
14	0.049	0.692	7.15	OK
15	0.116	0.692	16.81	OK
16	0.038	0.691	5.50	OK
17	0.093	0.692	13.42	OK
18	0.032	0.692	4.58	OK
19	0.072	0.692	10.43	OK
20	0.035	0.692	5.09	OK
21	0.064	0.692	9.27	OK
22	0.029	0.692	4.14	OK
23	0.057	0.692	8.18	OK
24	0.024	0.692	3.50	OK
25	0.050	0.692	7.16	OK
26	0.024	0.692	3.50	OK
27	0.055	0.692	8.01	OK
28	0.028	0.691	4.05	OK
29	0.054	0.692	7.82	OK
30	0.029	0.691	4.23	OK
31	0.046	0.692	6.67	OK
32	0.030	0.691	4.30	OK
33	0.046	0.692	6.65	OK
34	0.033	0.692	4.77	OK
35	0.041	0.692	5.90	OK
36	0.034	0.691	4.85	OK
37	0.044	0.692	6.36	OK
38	0.031	0.692	4.55	OK
39	0.042	0.692	6.11	OK
40	0.031	0.692	4.47	OK

Minimum R_{sce} required: R_{sce} = 5.201
Phase A = 15.8% of tested R_{sce} = 33.000, R_{sce} = 5.201



7. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Measuring Standard

EN 61000-3-11: 2000

7.3. Operation Condition of EUT

7.3.1. Me Setup the EUT as shown on Section 7.1.

7.3.2. Turn on the power of all equipment.

7.3.3. Let the EUT work in measuring mode (AC Charger Mode) and measure it.

7.4. Measuring Results

PASS.

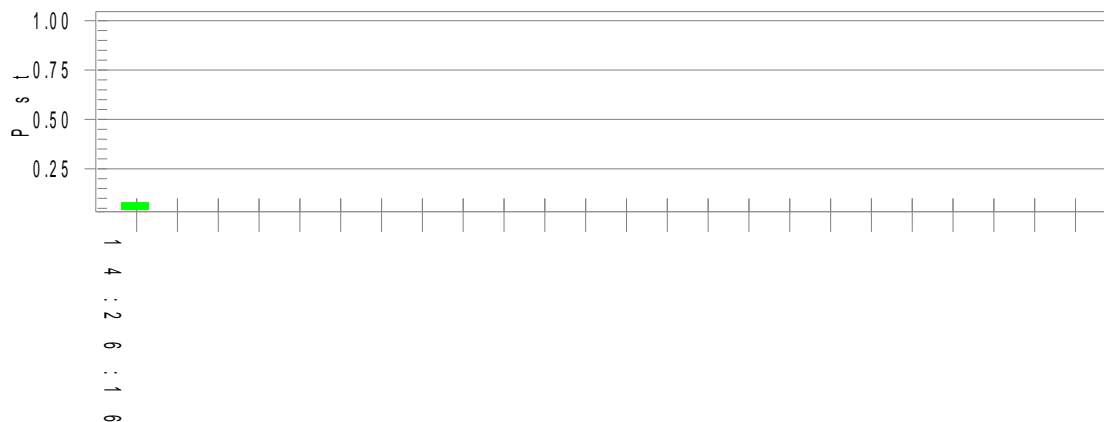
Please see the attached page.

Flicker Test Summary Per EN/IEC61000-3-11, Ed. 1.0(Run time) per EN/IEC61000-3-11 IEC61000-3-11 Ed. 1.0 (2000)

EUT: PV18-5248 PRO	Tested by: MUNDO
Test category: All parameters	Test Margin: 100
Test date: 2021/4/6	Start time: 11:25:06
Test duration (min): 10	End time: 11:35:33
Comment: AC Charging Mode	Data file name: WIN2106_F-000228.cts_data
Customer: SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD	
Z-test = (0.400 + j 0.250 Ohm)	

Test Result: Pass
Status: Test Completed

Pst_i and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	226.89			
T-max (mS):	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	-0.14	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.078	Test limit:	1.000	Pass

Calculated dmax(%): 0.141
 Calculated dc(%): 0.000
 Calculated Pst : 0.078
 Calculated Plt : 0.034

The maximum permissible system impedance Z_{sys}:

Z = 18.242 Ohm + j 11.401 Ohm (18.242 Ohm + 36291 ?H)

8. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION

Performance Level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level by its manufacturer or the requestor of the test, or the agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

1. Based on the used product standard
2. Based on the declaration of the manufacturer, requestor or purchaser

Criterion A:

The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criterion B:

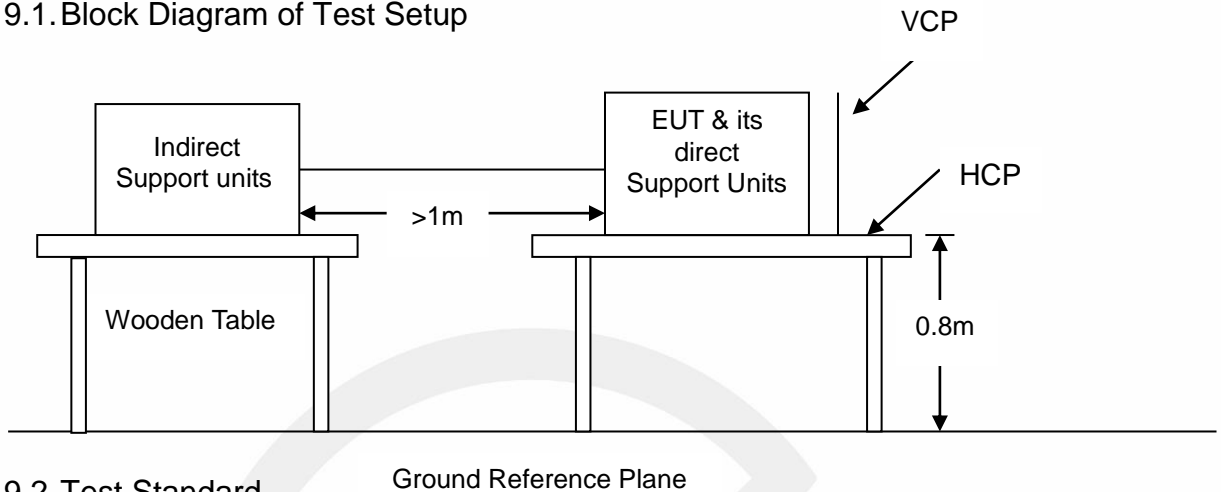
The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criterion C:

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

9. ELECTROSTATIC DISCHARGE IMMUNITY TEST

9.1. Block Diagram of Test Setup



9.2. Test Standard

EN IEC 61000-6-1: 2019
 (IEC 61000-4-2:2008 Severity Level: 3 / Air Discharge: $\pm 8\text{kV}$
 Level: 2 / Contact Discharge: $\pm 4\text{kV}$)

9.3. Severity Levels and Performance Criterion

9.3.1. Severity level

Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1	± 2	± 2
2	± 4	± 4
3	± 6	± 8
4	± 8	± 15
X	Special	Special

9.3.2. Performance criterion: B

9.4. Operating Condition of EUT

9.4.1. Setup the EUT as shown on Section 9.1.

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in test mode (off-grid mode, AC Charger Mode, Pv input mode) and test it.

9.5. Test Procedure

9.5.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

9.5.2. Contact Discharge:

All procedure shall be the same as Section 9.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

9.5.3. Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

9.5.4. Indirect discharge for vertical coupling plane

At least 10 singles discharge (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m×0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

9.6. Test Results

PASS.

Please refer to the following page.

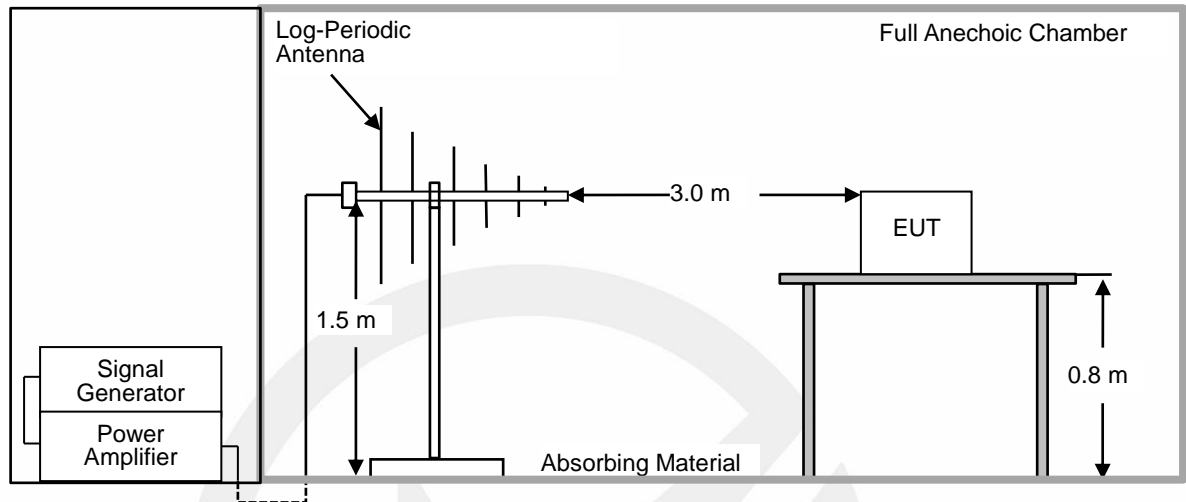
Electrostatic Discharge Test Result

EMTEK (SHENZHEN) CO., LTD.

Applicant	: SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD	Test Date	: 2021-04-06
EUT	: MPPT BASED SOLAR INVERTER	Temperature	: 26.2°C
M/N	: PV18-5248 PRO	Humidity	: 51%
Power Supply	: DC 48V, AC 230V/50Hz, DC 360V	Test ode	: off-grid mode, AC Charger Mode, Pv input mode
Air discharge	: ± 8.0kV	Criterion	: B
Contact discharge:	± 4.0kV		
Location	Kind A-Air Discharge C-Contact Discharge	Result	
METAL/SCREW	C	A	
SLOT/BUTTON/SCREEN	A	A	
HCP	C	A	
VCP of front	C	A	
VCP of rear	C	A	
VCP of left	C	A	
VCP of right	C	A	
Note:			

10. RF FIELD STRENGTH SUSCEPTIBILITY TEST

10.1. Block Diagram of Test Setup



10.2. Test Standard

EN IEC 61000-6-1: 2019
(IEC 61000-4-3:2006+A1:2007+A2:2010, Severity Level: 3V/m)

10.3. Severity Levels and Performance Criterion

10.3.1. Severity Levels

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

10.3.2. Performance Criterion: A

10.4. Operating Condition of EUT

10.4.1. Me Setup the EUT as shown on Section 10.1.

10.4.2. Turn on the power of all equipment.

10.4.3. Let the EUT work in test mode (off-grid mode, AC Charger Mode, Pv input mode) and test it.

10.5. Test Procedure

The EUT is placed on a table that is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna that is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor it. All the scanning conditions are as following:

Condition of Test	Remark
1. Fielded Strength	3V/m (Severity Level 2)
2. Radiated Signal	Modulated
3. Scanning Frequency	80-6000MHz
4. Sweep time of radiated	0.0015 Decade/s
5. Dwell Time	1 Sec.

10.6. Test Results

PASS.

Please refer to the following pages.

RF Field Strength Susceptibility Test Results

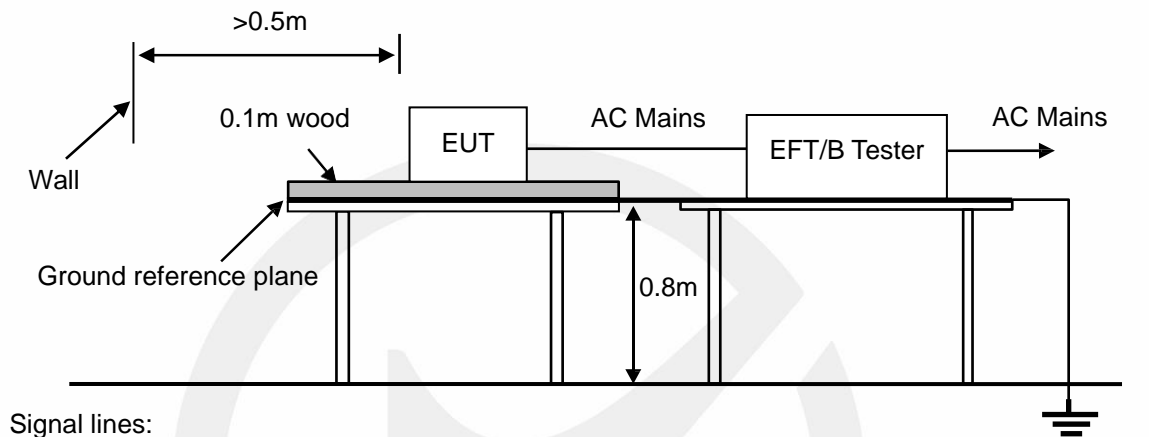
EMTEK (SHENZHEN) CO., LTD.

Applicant	: SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD			
EUT	: MPPT BASED SOLAR INVERTER		Test Date	: 2021-04-06
M/N	: PV18-5248 PRO		Temperature	: 24.3°C
Field Strength	: 3 V/m		Humidity	: 53%
Power Supply	: DC 48V, AC 230V/50Hz, DC 360V		Criterion	: A
Test Mode	: off-grid mode, AC Charger Mode, Pv input mode		Frequency Range	: 80 MHz to 1000 MHz 1400 MHz to 6000 MHz
Modulation: <input type="checkbox"/> None <input type="checkbox"/> Pulse <input checked="" type="checkbox"/> AM 1kHz 80%				
		Frequency Rang 1: 80~ 1000MHz (3V/m)	Frequency Rang 2: 1400~ 6000 MHz (3V/m)	
Steps	1%			
	Horizontal	Vertical	Horizontal	Vertical
Front	A	A	A	A
Right	A	A	A	A
Rear	A	A	A	A
Left	A	A	A	A
Test Equipment : 1. Signal Generator : N5181A (Agilent) 2. Power Amplifier : AS0102-55 (MILMEGA) & 80RF1000-175 (MILMEGA) & AS1860-50 (MILMEGA) 3. Log.-Per.Antenna: VULP9118E (SCHWARZBECK) 4. Broad-Band Horn Antenna: STLP 9149 (Schwarzbeck) 5. RF Power Meter. Dual Channel: 4232A (BOONTON) 6. Field Strength Meter: RSS1006A (DARE)				
Note:				

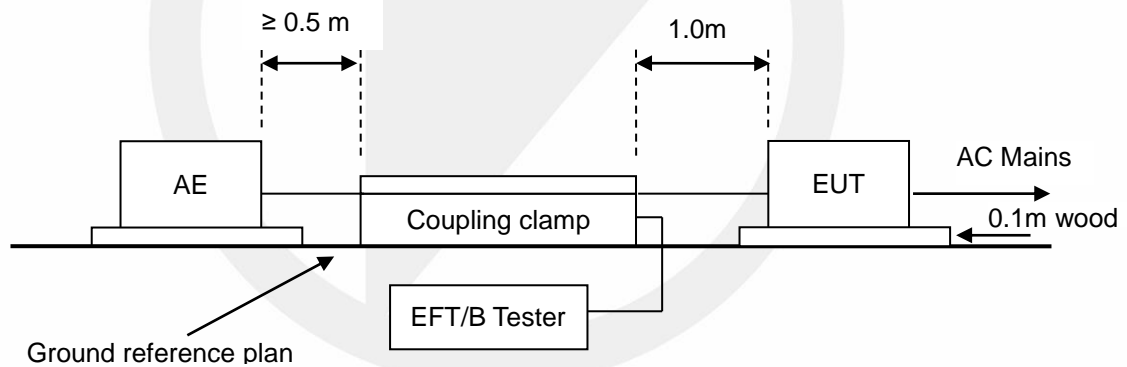
11. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

11.1. Block Diagram of Test Setup

AC Lines:



Signal lines:



11.2. Test Standard

EN IEC 61000-6-1: 2019
(IEC61000-4-4:2012, Severity Level: 2: 1kV)

11.3. Severity Levels and Performance Criterion

11.3.1. Severity level

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

11.3.2. Performance criterion: B

11.4. Operating Condition of EUT

11.4.1. Me Setup the EUT as shown on Section 11.1.

11.4.2. Turn on the power of all equipment.

11.4.3. Let the EUT work in test mode (AC Charger Mode) and test it.

11.5. Test Procedure

The EUT is put on the table that is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1 m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5 m.

11.5.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device that couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

11.5.2. For signal lines and control lines ports:

No I/O ports. It's unnecessary to test.

11.5.3. For DC output line ports:

It's unnecessary to test.

11.6. Test Results

PASS.

Please refer to the following page.

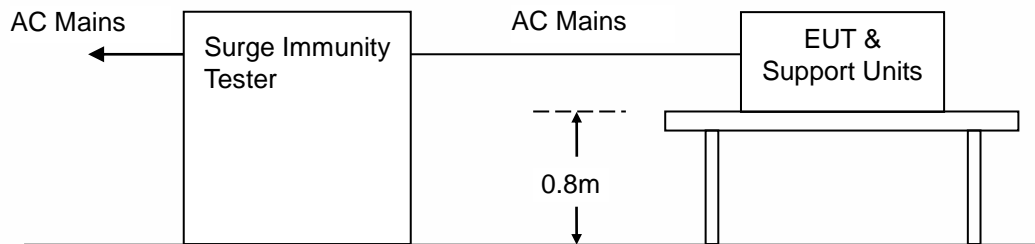
Electrical Fast Transient/Burst Test Results

EMTEK (SHENZHEN) CO., LTD.

Standard: <input checked="" type="checkbox"/> IEC 61000-4-4		Result: <input checked="" type="checkbox"/> PASS / <input type="checkbox"/> FAIL	
Applicant : <u>SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD</u>			
EUT : <u>MPPT BASED SOLAR INVERTER</u>			
M/N : <u>PV18-5248 PRO</u>			
Input Voltage: <u>AC 230V/50Hz, DC 48V</u>			
Criterion : B			
Ambient Condition :		<u>27.1°C</u>	<u>54% RH</u>
Operation Mode: AC Charger Mode			
Line : <input checked="" type="checkbox"/> AC Mains		Line : <input type="checkbox"/> Signal <input type="checkbox"/> I/O Cable	
Coupling : <input checked="" type="checkbox"/> Direct		Coupling : <input type="checkbox"/> Capacitive	
Test Time : 120s			
Line	Test Voltage	Result(+)	Result(-)
L	1kV	A	A
N	1kV	A	A
PE	1kV	A	A
L、N	1kV	A	A
L、PE	1kV	A	A
N、PE	1kV	A	A
L、N、PE	1kV	A	A
Signal Line			
DC Line			
Note:			

12. SURGE IMMUNITY TEST

12.1. Block Diagram of Test Setup



12.2. Test Standar

EN IEC 61000-6-1: 2019

(IEC 61000-4-5:2014, Severity Level: Line to Line: Level 2, 1.0kV; Line to Earth: Level 3, 2.0kV)

12.3. Severity Levels and Performance Criterion

12.3.1. Severity level

Severity Level	Open-Circuit Test Voltage kV
1	0.5
2	1.0
3	2.0
4	4.0
*	Special

12.3.2. Performance criterion: B

12.4. Operating Condition of EUT

12.4.1. Me Setup the EUT as shown on Section 12.1.

12.4.2. Turn on the power of all equipment.

12.4.3. Let the EUT work in test mode (AC Charger Mode) and test it.

12.5. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 12.1.2.
- 2) For line to line coupling mode, provide a 1.0 kV 1.2/50us voltage surge (At open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Different phase angles are done individually.
- 5) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

12.6. Test Results

PASS.

Please refer to the following page.



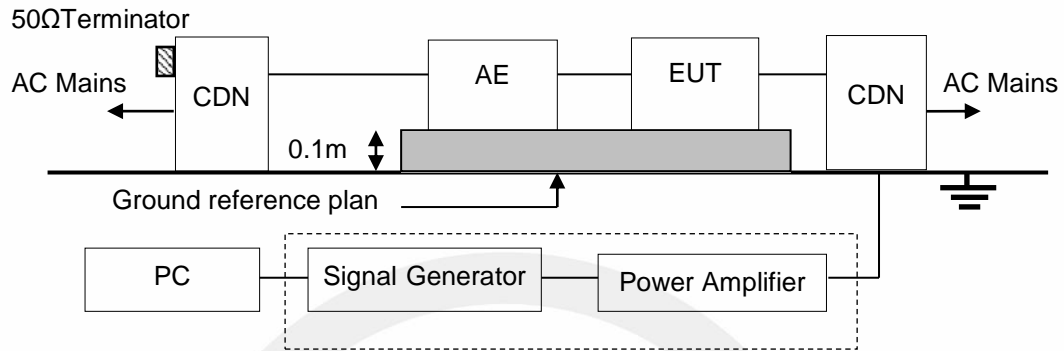
Surge Immunity Test Result

EMTEK (SHENZHEN) CO., LTD.

Applicant : <u>SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD</u>					
EUT : <u>MPPT BASED SOLAR INVERTER</u>			Test Date : <u>2021-04-06</u>		
M/N : <u>PV18-5248 PRO</u>			Temperature : <u>27.1℃</u>		
Power Supply : <u>AC 230V/50Hz, DC 48V</u>			Humidity : <u>54%</u>		
Test Mode : <u>AC Charger Mode</u>			Criterion : <u>B</u>		
Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (kV)	Result
L-N	+	0°/90°/180°/270°	5	1.0	A
	+	0°/90°/180°/270°	5	1.0	A
	-	0°/90°/180°/270°	5	1.0	A
	-	0°/90°/180°/270°	5	1.0	A
L-PE	+	0°/90°/180°/270°	5	2.0	A
	+	0°/90°/180°/270°	5	2.0	A
	-	0°/90°/180°/270°	5	2.0	A
	-	0°/90°/180°/270°	5	2.0	A
N-PE	+	0°/90°/180°/270°	5	2.0	A
	+	0°/90°/180°/270°	5	2.0	A
	-	0°/90°/180°/270°	5	2.0	A
	-	0°/90°/180°/270°	5	2.0	A
Remark:					

13. INJECTED CURRENTS SUSCEPTIBILITY TEST

13.1. Block Diagram of Test Setup



13.2. Test Standard

EN IEC 61000-6-1: 2019
(IEC 61000-4-6:2013, Severity Level: Level 2, 3V (r.m.s.), 0.15MHz ~ 80MHz)

13.3. Severity Levels and Performance Criterion

13.3.1. Severity level

Level	Field Strength V
1	1
2	3
3	10
X	Special

13.3.2. Performance criterion: A

13.4. Operating Condition of EUT

13.4.1. Me Setup the EUT as shown on Section 13.1.

13.4.2. Turn on the power of all equipment.

13.4.3. Let the EUT work in test mode (AC Charger Mode) and test it.

13.5. Test Procedure

- 1) Set up the EUT, CDN and test generators as shown on Section 13.1.2.
- 2) Let the EUT work in test mode and measure it.
- 3) The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150kHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.
- 7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. where the frequency is swept incrementally; the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

13.6. Test Results

PASS.

Please refer to the following page.

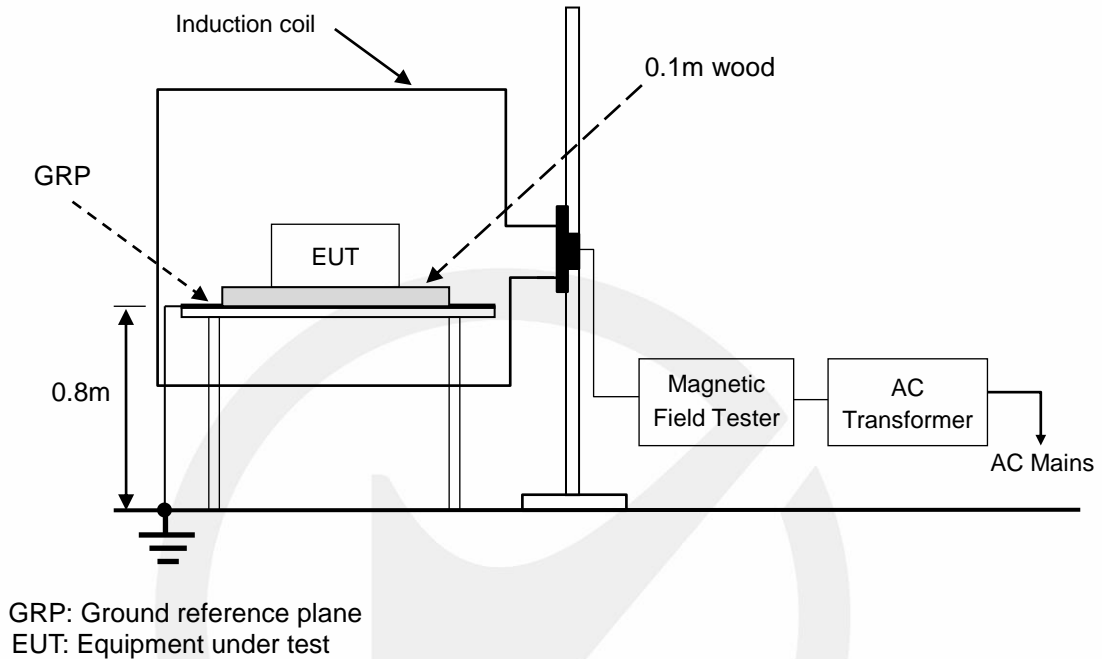
Injected Currents Susceptibility Test Results

EMTEK (SHENZHEN) CO., LTD.

Applicant : <u>SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD</u>				
EUT : <u>MPPT BASED SOLAR INVERTER</u>		Test Date: <u>2021-04-06</u>		
M/N : <u>PV18-5248 PRO</u>		Temperature : <u>27.1°C</u>		
Power Supply : <u>AC 230V/50Hz, DC 48V</u>		Humidity : <u>54%</u>		
Test Engineer : <u>MUNDO</u>				
Test Mode: <u>AC Charge Mode</u>				
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
0.15 ~ 80	AC Mains	3V	A	A
Test Mode : <u>N/A</u>				
Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
Remark : 1. Modulation Signal:1kHz 80% AM Measurement Equipment : Simulator: CWS 500C (SWITZERLAND EMTEST) CDN : <input type="checkbox"/> CDN-M2 (SWITZERLAND EMTEST) <input checked="" type="checkbox"/> CDN-M3 (SWITZERLAND EMTEST)		Note:		

14. MAGNETIC FIELD SUSCEPTIBILITY TEST

14.1. Block Diagram of Test Setup



14.2. Test Standard

EN IEC 61000-6-1: 2019
(IEC 61000-4-8:2009, Severity Level: Level 2, 3A / m)

14.3. Severity Levels and Performance Criterion

14.3.1. Severity Levels

Level	Field Strength A/m
1	1
2	3
3	10
4	30
5	100
X	Special

14.3.2. Performance Criterion: A

14.4. Operating Condition of EUT

14.4.1. Me Setup the EUT as shown on Section 14.1.

14.4.2. Turn on the power of all equipment.

14.4.3. Let the EUT work in test mode (off-grid mode, AC Charger Mode, Pv input mode) and test it.

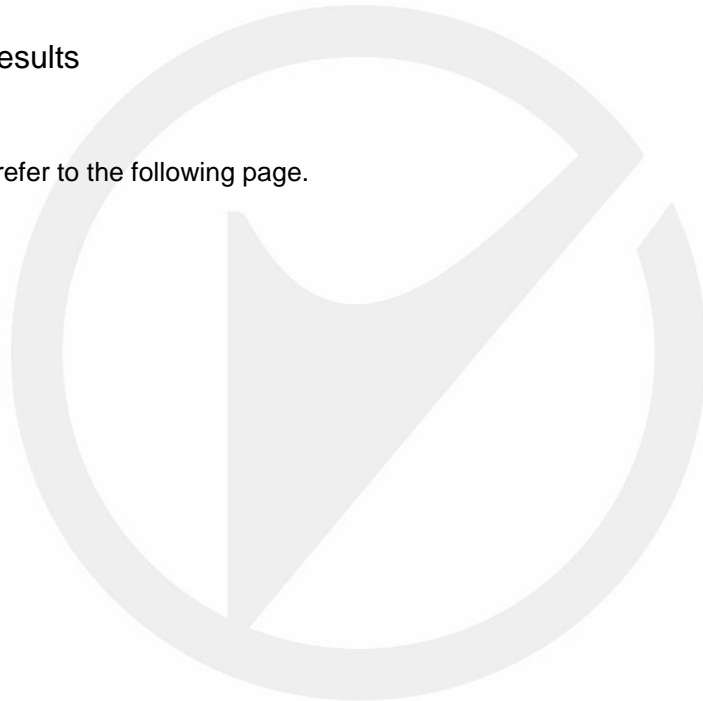
14.5. Test Procedure

The EUT is placed in the middle of a induction coil (1*1m), under which is a 1*1*0.1m (high) table, this small table is also placed on a larger table, above the ground. Both horizontal and vertical polarization of the induction coil is set on test, so that each side of the EUT is affected by the magnetic field. Also can reach the same aim by change the position of the EUT.

14.6. Test Results

PASS.

Please refer to the following page.



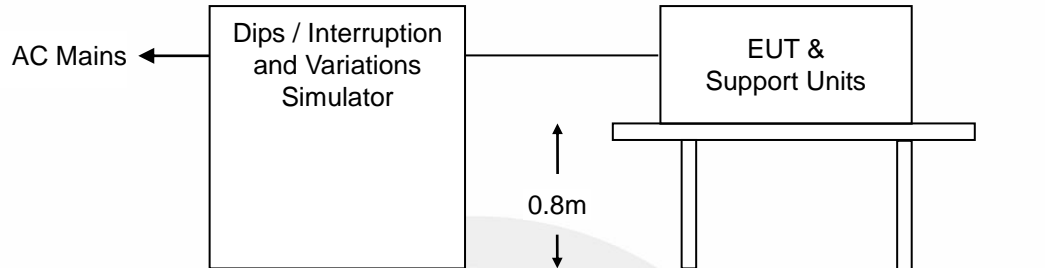
Magnetic Field Immunity Test Result

EMTEK (SHENZHEN) CO., LTD.

Standard: <input checked="" type="checkbox"/> IEC 61000-4-8	Result: <input checked="" type="checkbox"/> PASS / <input type="checkbox"/> FAIL			
Applicant : <u>SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD</u> EUT : <u>MPPT BASED SOLAR INVERTER</u> M/N : <u>PV18-5248 PRO</u> Input Voltage : <u>AC 230V/50Hz, DC 48V</u> Date of Test : <u>2021-04-06</u> Test Engineer: <u>MUNDO</u> Ambient Condition : Temp : <u>27.1°C</u> Humid: <u>54%</u> Criterion: A				
Operation Mode: off-grid mode, AC Charger Mode, Pv input mode				
Test Level (A/m)	Testing Duration	Coil Orientation	Criterion	Result
3	5 mins	X	A	A
3	5 mins	Y	A	A
3	5 mins	Z	A	A
Operation Mode: N/A				
Test Level (A/m)	Testing Duration	Coil Orientation	Criterion	Result
Test Equipment	Magnetic Field Test: HEAFELY MAG 100.1			
Note:				

15. VOLTAGE DIPS AND INTERRUPTIONS TEST

15.1. Block Diagram of Test Setup



15.2. Test Standard

EN IEC 61000-6-1: 2019 (IEC 61000-4-11:2004)

15.3. Severity Levels and Performance Criterion

15.3.1. Severity level

Test Level %UT	Voltage dip and short interruptions %UT	Duration (in period)
0	100	0.5
70	30	1
		5
		10
		25
0	100	50
		*

15.3.2. Performance criterion: B&C

15.4. Operating Condition of EUT

15.4.1. Me Setup the EUT as shown on Section 15.1.

15.4.2. Turn on the power of all equipment.

15.4.3. Let the EUT work in test mode (AC Charger Mode) and test it.

15.5. Test Procedure

- 1) Set up the EUT and test generator as shown on Section 15.1.2.
- 2) The interruption is introduced at selected phase angles with specified duration.
- 3) Record any degradation of performance.

15.6. Test Results

PASS.

Please refer to the following page.



Voltage Dips and Interruptions Test Results

EMTEK (SHENZHEN) CO., LTD.

Applicant : <u>SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD</u>				
EUT : <u>MPPT BASED SOLAR INVERTER</u>			Test Date : <u>2021-04-06</u>	
M/N : <u>PV18-5248 PRO</u>			Temperature : <u>27.1°C</u>	
Power Supply : <u>AC 230V/50Hz, DC 48V</u>			Humidity : <u>54%</u>	
Test Mode: AC Charger Mode				
Test Level % U _T	Voltage Dips & Short Interruptions % U _T	Duration (in periods)	Criterion <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D	Result
0	100	0.5P	B	A
0	100	1P	B	A
70	30	25P	C	A
0	100	250P	C	B
Note: Dips to 0%, Duration 250P, EUT stopped operation, but it can be resumed by itself after test.				

16. PHOTOGRAPHS

16.1. Photos of Conducted Emission Measurement



16.2.Photos of Radiation Emission Measurement



16.3.Photo of Harmonic / Flicker Measurement



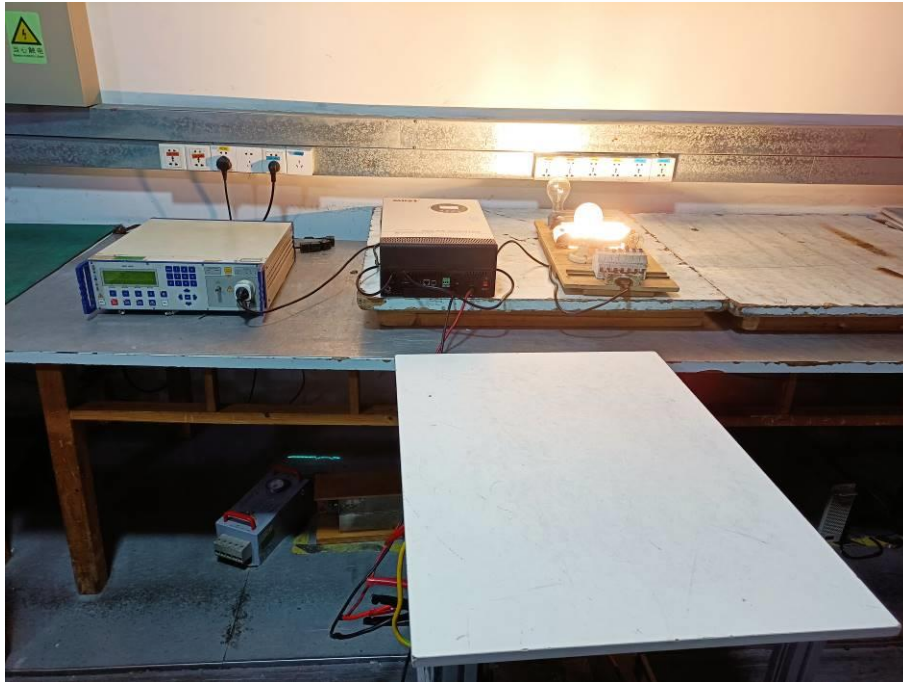
16.4.Photo of Electrostatic Discharge Test



16.5.Photo of RF Field Strength Susceptibility Test



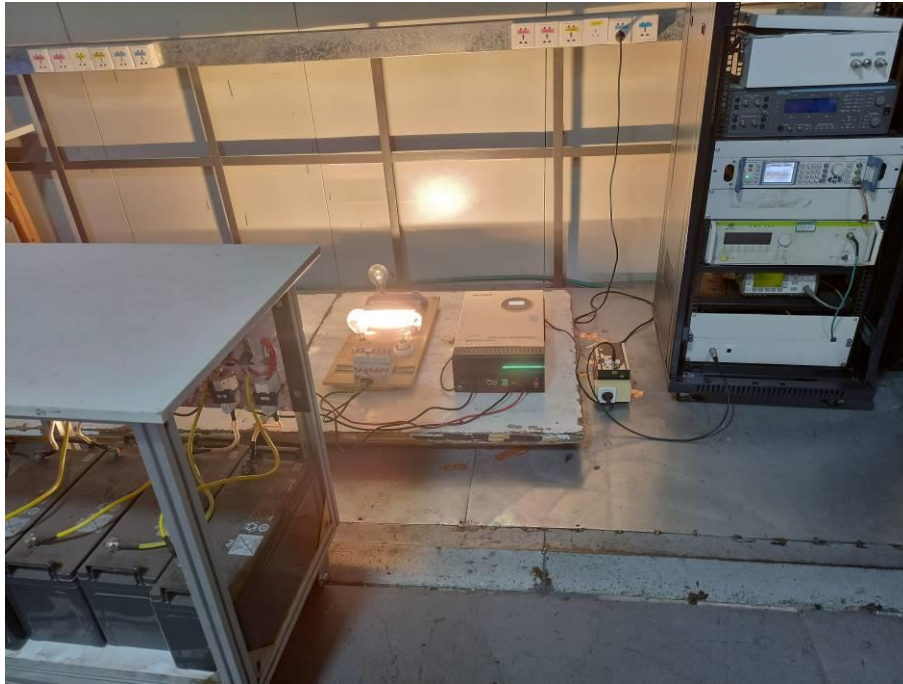
16.6.Photo of Electrical Fast Transient / Burst Test



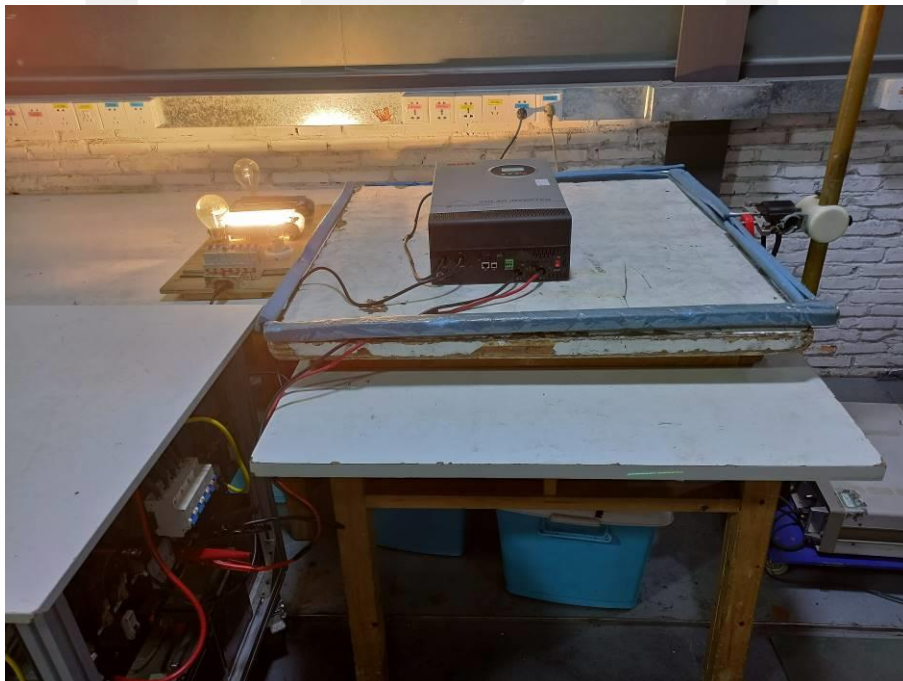
16.7.Photo of Surge Test



16.8.Photo of Injected Currents Susceptibility Test



16.9.Photo of Magnetic Field Immunity Test



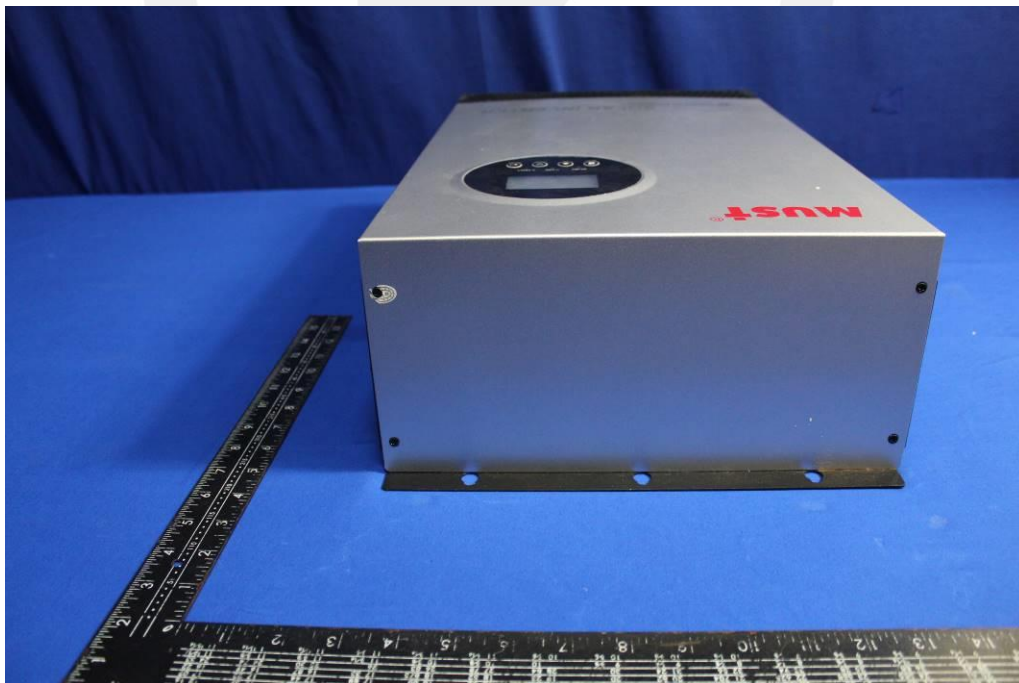
16.10.Photo of Voltage Dips and Interruption Immunity Test





APPENDIX (Photos of EUT)





*** End of Report ***